

a) when z is 1 or 2: hydrogen, alkyl of 1 to 18 carbon atoms or  $\text{HOCH}_2\text{CH}_2$ ,  
b) when z is 2: additionally OH, and  
c) when z is 1: either as defined under a) independently for the two  $\text{R}^1$  radicals or as defined under a) in one instance and as defined under b) in the other,  
 $\text{R}^2$  and  $\text{R}^3$ , which may be the same or different, are each hydrogen or alkyl of 1 to 4 carbon atoms subject to the proviso that together they have not more than 4 carbon atoms, and  
M is one equivalent of a mono- or divalent metal atom,  
at pH 4 - 7, optionally followed by an aftertreatment with hydrogen peroxide.

In the claimed process for controlled partial decolorization (lightening) of vat- or sulfur-dyed or printed textile materials a optimum color contrast or washdown effect is consistently achieved in a rapid and environmentally safe procedure, disadvantages of the prior art being avoided or reduced thereby.

Textile materials are generally dyed in the form of the unprocessed fabrics; however, it is also possible to dye garments made of such textile materials. Yarn dyeing is predominantly practiced to produce textile sheet materials featuring special effects, for example bicolor effects. A well known textile material featuring such a special effect is denim. To produce denim, the yarns which in the later woven fabric will form the warp threads which extend in the longitudinal direction of the woven web are dyed in a certain color, while the yarns for the transverse weft threads are dyed in a different color or are left undyed.

Denim material has achieved an extraordinary economical significance for hardwearing workwear items and especially for Blue Jeans. Such denim material is generally manufactured using a coarse cotton fabric (denim), which is customarily dyed with the vat dye indigo. To create the typical appearance of a pair of blue jeans, generally only the warp

threads are dyed prior to weaving and the weft is left colorless. After weaving and making up, it is frequently desired that the garment be partially decolorized again. In fact, only exposed areas of the garment are to be decolorized, such as the seams.

It is important in a process for partially decoloration of denim materials, particularly Blue Jeans material, that the pronounced color contrast between the dyed warp threads and the colorless weft threads is preserved, i.e., the latter must not become stained ("backstained") in the course of the lightening process. This is the reason that difficulties arise in the known processes for lightening colored textile material using reducing decoloration agents.

In order to avoid backstaining it has been suggested to add backstaining inhibitors to the lightening liquors. This measure has the disadvantage, the waste water of the process is additionally contaminated and, consequently a higher cost is involved for its cleansing treatment.

Another process for lightening Blue Jeans is a stonewashing method, wherein the material is mechanically treated with pumice stones and/or cellulases. Stonewashing is time-consuming and inconvenient, since the pumice stones have to be removed again from the material, and this is at least partly done by hand. The stones are responsible for abrading the equipment and major amounts of sludge arise and have to be disposed of. The visual effect obtained in this way is very good, but the lightening effect is only minimal, so that generally a bleaching process is additionally carried out.

Another bleaching process is enzymatic bleach by means of laccases. However, laccases are so costly that this process is too uneconomical for everyday textile finishing practice.

The oxidative removal of dyes may be carried out, for example, using strong oxidizing agents, such as alkali metal hypochlorite, ozone or alkali metal permanganate. However,

oxidative processes are disadvantageous because of the pronounced fiber damage and, especially in the case of the use of hypochlorites, an unfavorable ecological aspects.

The reductive lightening process of the present invention surprisingly offers a drastic decrease of backstaining and at the same time avoids the technical and economical problems which arise with mechanical (stonewashing) or oxidative processes.

Specifically, an advantage of the claimed process is that backstaining of dissolved dye, for example indigo, on the fibers especially on any differently colored, or in the case of denim material undyed, weft is minimized in that such a weft is left substantially unstained and, if appropriate, a very good contrast is obtained between warp dyeing and weft. The process of the invention is thus a particularly efficient, simple and economical way of achieving a washdown effect. This makes the process of the invention especially useful in jeans production.

Another surprising result is that the portion of the vat or sulfur dye, especially the portion of indigo, which has become redeposited on the fiber is easily removable (for example, by an oxidative aftertreatment with hydrogen peroxide) when the bleach is carried out according to the present invention. This removal of indigo deposited on the fiber takes place even though hydrogen peroxide alone is not capable of lightening indigo dyeings.

The bleaching agents of the formula I are very gentle on the fiber. By working in a neutral to weakly acidic medium there is no need for the otherwise required costly and ecologically unfavorable neutralization.

A further advantage of the present process results from the fact that the aminoalkanesulfinates have not necessarily to be isolated from the aqueous solution, nor the corresponding sulfonates (which are formed in the preparation of the sulfinates as by-products) to be separated off. Rather, the as-obtained aqueous reaction mixture solution can

be used directly for the process of the invention. These solutions have very good stability in storage and the advantage for the user that the complicated dissolving of a solid substance in water is eliminated and instead the aqueous solution need only be diluted to appropriate concentration.

Beckman et al, the reference relied upon by the Examiner, on the other hand, is not directed to a process of partial decolorization or lightening of a textile material. Rather, Patentee's discovery is directed to a process for the reductive post-cleaning of dyed textile materials containing polyester fibers. In this process, a wide variety of substances are used as reducing agents, *inter alia*, and including those of defined formula I in the claims. However, the process of Beckman et al is clearly distinctly different from the claimed process.

Thus, post-cleaning processes, as in Beckman et al, are performed immediately after dyeing in order to remove dyestuff particles which are more or less loosely adsorbed at the surface of the fiber and to eliminate dyestuff quantities which are remaining in the dyeing liquor. Post-cleaning is necessary to improve the wash-fastness of the dyed textile material.

It is apparent that substances used in a cleaning process must under no circumstances attack the dyestuff inside the fiber, which is responsible for the coloration of the textile materia. Thus, use of a substance in a post cleaning process suggests to those skilled in the art that this substance will not attack dyestuffs inside a fiber, i.e., that is not suitable for use in lightening process. Beckman et al thus clearly teaches away from the present process. It certainly does not provide any incentive or motivation to one skilled in the art to use aminoalkane sulfinic acid salts or aminoalkane sulfonic acid salts for a stripping or lightening process. Rather, a person skilled in the art would be dissuaded from using substances used in cleaning processes for lightening methods.

Manifestly, Beckman et al neither teach, within the meaning of 35 U.S.C. § 102, nor make obvious, within the meaning of 35 U.S.C. § 103, Applicants' discovery. Withdrawal of this rejection thus is requested.

With regard to the further rejection of the claims under 35 U.S.C. § 103(a) over Fono in view of Beckman et al, it equally lacks viability.

Fono is directed to a process of stripping dyes from textile fabric. However, its invention resides in the use of a specific combination of sodium hydroxymethane sulfinic acid, an ammonium salt and a sulfite salt in an aqueous stripping liquid having a pH of from about 5 to 9. Note column 2, lines 7-10. It is only this particular combination that is suitable for such purpose. Such, however, is not the case in the claimed invention.

Specifically, it is apparent from Fono that stripping of textiles with hydroxyalkane sulfinates is achieved only due to the presence of an additional reducing agent, i.e., a sulfite anion, not required by the present process. The process of Fono thus has serious drawbacks in its application. The most severe disadvantage is that the extent of backstaining is unacceptably high so that it can be applied only if relatively high quantities of backstaining inhibitors are used, which, of course, have to be removed from the effluent of the process. Moreover, the sulfites which have necessarily to be used in combination with hydroxyalkane sulfonic acid salts are strong reducing agents, and thus significantly increase the oxygen demand when cleaning the effluent of Fono's process. The advantage, that comparatively low amounts of hydroxyalkane sulfonic acid salts are used, thus is of no benefit.

The Examiner additionally relies on Beckman et al in combination with Fono for obviousness of the claimed invention. However, the Examiner overlooks the fact that aminoalkane sulfinates, as is taught by Beckman et al, is formed by the reaction of hydroxyalkanesulfonates with ammonia ( $\text{NH}_3$ ), not with ammonium ion. It is known that the

reaction of these reactants depends on the "free pair of electrons" situated at the N-atom of ammonia. Ammonium cations do not have such a free pair of electron because of the addition of a proton to the  $\text{NH}_3$  molecule. Solutions of ammonium sulfate, as preferably used by Fono, contain only extremely low concentrations of free  $\text{NH}_3$ , which certainly is not sufficient to form significant amounts of aminoalkane sulfinates in the presence of hydroxyalkane sulfinates.

Further, Fono clearly states that the reducing agent of his stripping composition is hydroxyalkane sulfinate (col. 2, lines 67-68) which is activated by the combination of ammonium cations and sulfate anions. In other words, the desired enhancement of strippability of hydroxyalkan sulfinates can be obtained only if in addition to ammonium cations a second reducing agent, namely sulfite anions, is present. The process of the present invention, however, is accomplished without sulfite anions.

Consequently, the process of the present invention clearly distinguishes over Fono's stripping process. Further, it is not obvious from a combination of Fono's and Beckman et al's teachings to use aminoalkane sulfinates of the formula I as an active ingredient in the lightening process of the present application.

Withdrawal of the rejection of the claims and 35 U.S.C. 103 over Fono in view of Beckman et al thus is requested.

With regard to the rejection of the claims under 35 U.S.C. § 101 and § 112, second paragraph, as well as the objection thereto, they have been amended in a manner believed to obviate these rejections and objection.

Should any further amendment to the claims be considered necessary by the Examiner, he is requested to contact the undersigned by telephone so that mutually agreeable language may be arrived at.

Withdrawal of the rejection of the claims under 35 U.S.C. § 101 and § 112, second paragraph, as well as the objection thereto, thus is requested.

It is submitted that this application is now in condition for allowance and which is solicited.

Respectfully submitted,

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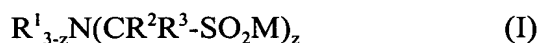
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Amendment Filed Herewith

IN THE CLAIMS

--1. (Amended) A process for controlled partial decolorization of vat- or sulfur-dyed or -printed textile material, [especially denim fabric,] which comprises treating the textile material to be lightened or de-colored with one or more compounds [(aminoalkane-sulfonates)] of the formula I



[Where] where

z is 1, 2 or 3,

R<sup>1</sup> is

a) when z is 1 or 2: hydrogen, alkyl of 1 to 18 carbon atoms or HOCH<sub>2</sub>CH<sub>2</sub>,

b) when z is 2: additionally OH, and

c) when z is 1: either as defined under a) independently for the two R<sup>1</sup> radicals or as defined under a) in one instance and as defined under b) in the other,

R<sup>2</sup> and R<sup>3</sup>, which may be the same or different, are each hydrogen or alkyl of 1 to 4 carbon atoms subject to the proviso that together they have not more than 4 carbon atoms, and

M is one equivalent of a mono- or divalent metal atom,

at pH 4 - 7, optionally followed [if desired] by an aftertreatment with hydrogen peroxide.

3. (Amended) A process as claimed in claim 1, utilizing mixtures of compounds of the formula I where the z indices have different meanings, [especially mixtures in which the



various compounds are present in that ratio which corresponds to their equilibrium concentration in an aqueous system of compounds of the formula I, the amine or the hydroxylamine of the formula  $R^1_{3-z}NH_z$  and a hydroxyalkanesulfinate of the formula  $HO-CR^2R^3-SO_2M$ ,] where [R1, R2, R3]  $R^1, R^2, R^3$ , z and M are each as defined above and the molar ratio of sulfur-containing compounds to nitrogen-containing compounds is in the range from 0.2 to 1.1.

5. (Amended) A process as claimed in claim 1, wherein the textile material is additionally[, preferably concurrently,] treated with one or more further assistants selected from the group consisting of [the] backstain inhibitors and/or dispersants and/or surfactants[, preferably in total in an amount of from 0.5 to 10.0 g/l].

9-10. (Cancelled).

11. (Amended) [A method of using aminoalkanesulfinates of the formula I or of mixtures thereof, where] A process as claimed in claim 1 wherein in the compounds the z indices have different meanings[,] for preparing discharge prints [especially in the half-tone area].

12-14. (New).--